APPENDIX I
## APPENDIX I

During recent years, a need has arisen for very short-time creep-rupture data. These data are necessary for the proper design of rocket motors, missiles, and to some extent supersonic aircraft. Some short-time creep-rupture data were available for three of the alloys included in this report, and these data are given in this appendix.

### ALLOY DATA

<table>
<thead>
<tr>
<th>Alloy</th>
<th>Source of Data</th>
<th>Chemical Composition, per cent</th>
<th>Sheet Thickness, in.</th>
<th>Heat Treatment</th>
<th>Room Temperature Hardness, Rockwell B</th>
</tr>
</thead>
<tbody>
<tr>
<td>N-155</td>
<td>Cornell Aeronautical Laboratory</td>
<td>Carbon 0.13, Manganese 1.45, Silicon 0.56, Chromium 21.01, Nickel 19.26, Cobalt 20.17, Molybdenum 3.16, Tungsten 2.41, Columbium 0.86, Iron Balance</td>
<td>0.045</td>
<td>Annealed</td>
<td>89</td>
</tr>
<tr>
<td>Inconel “X”</td>
<td>Cornell Aeronautical Laboratory</td>
<td>Carbon 0.04, Manganese 0.71, Silicon 0.30, Chromium 14.86, Nickel 72.63, Cobalt —, Molybdenum —, Tungsten 1.09, Columbium 2.42, Iron 1.00</td>
<td>0.044</td>
<td>Annealed + 1550 F for 84 hr, + 1300 F for 20 hr</td>
<td>107, 106</td>
</tr>
<tr>
<td></td>
<td>Battelle Memorial Institute</td>
<td>Carbon 0.04, Manganese 0.47, Silicon 0.35, Chromium 15.17, Nickel 73.14, Cobalt —, Molybdenum —, Tungsten 1.00, Columbium 2.43, Iron 0.79</td>
<td>0.062</td>
<td>—</td>
<td>—</td>
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<tr>
<td>Haynes Alloy</td>
<td>Cornell Aeronautical Laboratory</td>
<td>Carbon 0.13, Manganese 1.5, Silicon 0.40, Chromium 20.0, Nickel 10.0, Cobalt —, Molybdenum —, Tungsten —, Columbium —, Iron 15.0</td>
<td>0.066</td>
<td>2200 F for 20 min, air cooled</td>
<td>96</td>
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<tr>
<td>No. 25</td>
<td>Battelle Memorial Institute</td>
<td>Carbon 0.09, Manganese 1.60, Silicon 0.60, Chromium 19.67, Nickel 10.32, Cobalt —, Molybdenum —, Tungsten —, Columbium —, Iron 15.5</td>
<td>0.050</td>
<td>Hot rolled</td>
<td>—</td>
</tr>
<tr>
<td>Haynes Alloy</td>
<td>Battelle Memorial Institute</td>
<td>Carbon 0.07, Manganese 1.34, Silicon 0.41, Chromium 18.72, Nickel 10.20, Cobalt —, Molybdenum —, Tungsten —, Columbium —, Iron 15.5</td>
<td>0.050</td>
<td>Annealed at 2275 F</td>
<td>—</td>
</tr>
</tbody>
</table>
DESIGN CURVES FOR LOW CARBON N-155 ALLOY SHEET AT 1350 F
Cornell Aeronautical Laboratory, Inc.

DESIGN CURVES FOR LOW CARBON N-155 ALLOY SHEET AT 1500 F
Cornell Aeronautical Laboratory, Inc.
STRESS-TIME RELATIONSHIPS AT GIVEN STRAIN VALUES FOR INCONEL "X" AT 1800 F
Heating Rate, 1625 F per second; deformations include thermal expansion of 1.75 per cent
U.S. Naval Ordnance Test Station

DESIGN CURVES FOR INCONEL "X" ALLOY SHEET AT 1350 F
Cornell Aeronautical Laboratory, Inc.
DESIGN CURVES FOR INCONEL "X" ALLOY SHEET AT 1500 F
Cornell Aeronautical Laboratory, Inc.

DESIGN CURVES FOR INCONEL "X" ALLOY SHEET AT 1800 F
Heating Rate, 125 F per second
Battelle Memorial Institute
DESIGN CURVES FOR HOT-ROLLED HAYNES ALLOY NO. 25 SHEET AT 1500, 1800, AND 2000 F
DESIGN CURVES FOR ANNEALED HAYNES ALLOY NO. 25 SHEET AT 1500, 1800, AND 2000 F
DESIGN CURVES FOR HAYNES ALLOY NO. 25 SHEET AT 1500 AND 1800 F (2200 F FOR 20 MINUTES, AIR COOLED)

Cornell Aeronautical Laboratory, Inc.